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Corrosion Assessment Criteria: Rationalizing Their Use Applied to Early Versus Modern Pipelines
Agreement DTRS56-03-T-0014
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Contractor: Battelle

Technical Status

Work during this reporting period focused on developing guideline for corrosion on welds, including both girth welds and long seams. This began with a kick off meeting held in September '03 and a literature review. This was followed by consideration of ways to bridge technology gaps and thereafter guidelines for defect assessment were considered.
Literature was reviewed in reference to failure processes at welds, addressing possible failure via plastic collapse and fracture. Approaches to bridge gaps between criteria were considered from two perspectives. Differences and similarities between criteria were considered first as a means to identify why specific criteria seemed to work well in comparison to full-scale test data. Then the objective of the federally funded part of effort – develop quantitative measures to determine which of the current corrosion assessment criteria are valid – was considered. Geometric features characteristic of various forms of corrosion were evaluated, along with the vintage, grade, and other metrics that characterize the flow and fracture response of the line pipe, and the pipeline's service and loading.

The results indicate that there is no reason to consider a weld seam different than base metal if the weld is free of defects, and the properties are comparable or better than the base metal. Inspection capabilities today are much better than historically, which means one can more simply discriminate between "good" and "bad" welds. Vintage and construction practices also help guide this decision. Work in regard to laboratory specimens has been completed. Mechanics to characterize plastic collapse of defect free pipe likewise have been developed within a fully general plasticity framework. Defect specimen and loading aspects have been addressed via results of finite element analysis. A constraint parameter has been identified for different defect specimen geometry and loadings that is consistent with the published literature. The focus of these aspects shifts not to pipelines and continues into the next reporting periods.

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